

FORM PTO-1590 (Modified)
(REV 11-98)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

1849-C

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

09/673885

INTERNATIONAL APPLICATION NO.

PCT/AU99/00576

INTERNATIONAL FILING DATE

16 July 1999

PRIORITY DATE CLAIMED

16 July 1998

TITLE OF INVENTION

INTERNET UTILITY INTERCONNECT METHOD AND MEANS

APPLICANT(S) FOR DO/EO/US

NGO, Get Sen and PARSONS, Ewan



Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
 - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 20 below concern document(s) or information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☒ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ Certificate of Mailing by Express Mail
20. ☒ Other items or information:

Clean Copy of Amended Claims

Verified Statement Claiming Small Entity Status - Independent Inventor

Verified Statement Claiming Small Entity Status - Small Business Concern

Copy of Request

Copy of Written Opinion

Copy of Response to Written Opinion

Copy of Change of Name of Applicant (as per PCT application)

U.S. APPLICATION NO. (IF KNOWN) 09/575885 (known)	INTERNATIONAL APPLICATION NO. PCT/AU99/00576	ATTORNEY'S DOCKET NUMBER 1849-C
-------------------------------------------------------------	--------------------------------------------------------	-------------------------------------------

21. The following fees are submitted:

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):

- ☐ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1,000
- ☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$840.00
- ☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$690.00
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$670.00
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$96.00

ENTER APPROPRIATE BASIC FEE AMOUNT =**\$1,000.00**

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).

\$0.00

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	23 - 20 =	3	x \$18.00	\$54.00
Independent claims	5 - 3 =	2	x \$80.00	\$160.00
Multiple Dependent Claims (check if applicable) <input type="checkbox"/>				\$0.00

TOTAL OF ABOVE CALCULATIONS = \$1,214.00

Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable). ☒ **\$607.00**

SUBTOTAL = \$607.00

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).

\$0.00**TOTAL NATIONAL FEE = \$607.00**

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). ☒ **\$80.00**

TOTAL FEES ENCLOSED = \$687.00

Amount to be refunded
charged \$

- ☒ A check in the amount of **\$687.00** to cover the above fees is enclosed.
- ☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees.
A duplicate copy of this sheet is enclosed.

- ☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **19-0083** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Joseph A. Sebolt
SAND & SEBOLT
Aston Park Professional Centre, Suite 194
4801 Dressler Road, NW
Canton, Ohio 44718

SIGNATURE

Joseph A. Sebolt

NAME

35,352

REGISTRATION NUMBER

DATE

10/19/00

422 Rec'd PCT/PTO 19 OCT 2000

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF : NGO, Get Sen and PARSONS, Ewan
FOR : INTERNET UTILITY INTERCONNECT
METHOD AND MEANS
SERIAL NO. : Not yet known
FILING DATE : Filed Herewith
Priority Application : PCT/AU99/00576
ATTORNEY DOCKET NO. : 1624-S

Assistant Commissioner for Patents
Washington, D.C. 20231

REMARKS

The Applicant filed an application in Australia on 16 July 1998, and a PCT application on 16 July 1999. During the International Phase of the PCT application, the Search Report issued on 20 August 1999, the First Written Opinion on 31 January 2000 and the Applicant's Australian agent amended the description and claims of the PCT application on 24 March 2000. As Applicant's U.S. attorneys do not know whether the Australian agent's amendments have been forwarded to the U.S. Patent and Trademark Office by the International Bureau, the specific amendments are included herewith as a preliminary amendment to the application. The Applicant's U.S. attorneys have submitted a substitute specification including the amendments made by the Australian agent and would request that the substitute specification replace the originally filed specification. As required, Applicant has specified the exact nature of the amendments in the following Preliminary Amendment section of this document.

422 Rec'd PCT/PTO 19 OCT 2000

Applicant's attorney has amended the claims of the substitute specification to remove the multiple dependencies. Applicant has therefore canceled claims 1-17 and has replaced them with claims 1-23. A clean copy of claims 1-23 is provided herewith.

PRELIMINARY AMENDMENT

The application was amended as follows:

In the Specification

Please change page 2, line 1as follows:

"control means, said first control means further adapted to communicate with said second control means;"

Please change page 2, line 4 to line 8 as follows:

"input means enabling said status to be altered[.];
wherein when said status has been altered the second control means
communicates said new status to said first control means which subsequently
checks the status of said apparatus and alters it if necessary to be the same as
the new communicated status and wherein when the status of said electrical
apparatus has been altered the new status is communicated to the first control
means and to the second control means, said second control means altering the
dynamic memory to reflect the status of the apparatus."

Please amend page 2, line 17 as follows:

"means status and wherein when the status of said meter has been altered the
new status is communicated to the first control means and to the second control

means, said second control means altering the dynamic memory to reflect the status of the meter."

Please amend page 3, line 3 as follows:

"said first [controller] control means."

Please amend page 3, line 24 by inserting the following phrase:

"a control means on said apparatus." **before the following:** "a sensor on said apparatus communicating information about said"

Please amend page 3, line 27 - 29 as follows:

"server accessible through [communication including] the Internet and having a [database] homepage which [changes based on received and analysed operation of said apparatus and which enables control of said apparatus] reflects the status of said apparatus wherein when the status of the apparatus changes, the homepage is changed to reflect the new status and when the homepage is changed the apparatus is controlled and changed to reflect the new status"

Please amend page 4, line 3 as follows:

"information [and enabling control of said electrical appliance through said controller] wherein when the status of the apparatus changes, the homepage is changed to reflect the new status and when the homepage is changed the apparatus is controlled and changed to reflect the new status."

Please amend page 4, line 5 as follows:

Replace the word "from" with the word "form".

Please amend page 4, line 14 as follows:

Replace the word "whin" with the word "which".

Please amend page 9, line 34 as follows:

Insert the word "database" between "standard" and "addresses"

Please amend page 10, line 8 as follows:

"internet address space and is used to collect utility data from remote meters, as well as hold the status of each device for remote access over the Internet."

Please amend page 10, line 22 as follows:

"requests for data to be sent via cable or satellite to the TV in the home. This allows for datacasting and multicasting requests to be serviced over the utility infrastructure."

Please amend page 10, line 28 as follows:

"shedding leading using the internet [leading]. This leads to prompt payment or prepayment."

Please amend page 11, line 33 as follows:

"the Internet using eCommerce security methods (e.g. name and password or

digital signature). The"

Please amend page 16, line 15 as follows:

Delete "eHome Cabling Example" and replace with "eLink Wire Cable"

Please amend page 16, line 20 as follows:

Delete "eHome" and replace with "eLink"

Please amend page 17, line 1 by inserting the following paragraph before the title:

"Thus the present invention also provides a master wiring key configuration for multiple use of Category cable as defined by the eLink wire printout definition which is combined with unique numbers for each device on pin 3."

In the Claims

The claims as filed in the original application have been amended more clearly to define the Applicant's method and means in light of the references located in the International Search. The claims have also been rewritten to remove all multiple dependent claims. Applicant therefore requests that the claims as originally filed and amended, i.e. claims 1-17 be canceled and that new claims 1-23 be substituted therefore.

Respectfully submitted at Canton, Ohio, this 19th day of October, 2000

SAND & SEBOLT



By: Joseph A. Sebolt
Reg. No. 35,352

Aston Park Professional Centre
4801 Dressler Road, NW, Suite 194
Canton, OH 44718
Telephone: (330) 492-1925
JAS/ff
Attorney Docket: 1849-C

422 Rec'd PCT/PTO 1 9 OCT 2000

CLAIMS

Having thus described the invention, it is claimed:

1. A system for the remote control of at least one electrical apparatus
said system including:

a first control means adapted to communicate with said
apparatus;

a second control means adapted to communicate with said first
control means;

said second control means including a dynamic memory storing
information about the status of said electrical apparatus and including an
input means enabling said status to be altered:

wherein when said status has been altered the second control means
communicates said new status to said first control means which subsequently
checks the status of said apparatus and alters it if necessary to be the same
as the new communicated status and wherein when the status of said
electrical apparatus has been altered the new status is communicated to the
first control means and to the second control means, said second control
means altering the dynamic memory to reflect the status of the apparatus.

2. A system for the remote access of at least one utility meter said
system including:

a first control means adapted to communicate with said meter;

a second control means adapted to communicate with said first
control means;

said second control means including a dynamic memory storing
information about the status of said meter wherein said status is updated by
the first control means communicating said new status to said second control

means status and wherein when the status of said meter has been altered the new status is communicated to the first control means and to the second control means, said second control means altering the dynamic memory to reflect the status of the meter.

5

3. A system as claimed in claim 1 wherein said information is security protected from access by unauthorized persons.

4. A system as claimed in claim 2 wherein said information is security protected from access by unauthorized persons.

5. A system as claimed in claim 2 wherein said meter information is further accessible by the appropriate utility authority through said second control means.

6. A system as claimed in claim 5 wherein said utility authority can control said utility meter.

7. A system as claimed in claim 1 wherein said second control means communicates to said first control means via the Internet.

8. A system as claimed in claim 2 wherein said second control means communicates to said first control means via the Internet.

9. A system as claimed in claim 1, wherein said second control means communicates with said first control means via an electrical power distribution means.

10. A system as claimed in claim 2, wherein said second control means communicates with said first control means via an electrical power distribution means.
11. A system as claimed in claim 1 wherein said second control means receives regular status updates from said first control means.
12. A system as claimed in claim 2 wherein said second control means receives regular status updates from said first control means.
13. A system as claimed in claim 6 wherein said updates occur at regular predetermined temporal intervals.
14. A system as claimed in claim 6 wherein said updates occur continuously.
15. A system as claimed in claim 1 wherein said status includes information such as control information, management information and service information of said apparatus.
16. A system as claimed in claim 2 wherein said status includes information such as control information, management information and service information of said apparatus.
17. A system as claimed in claim 1 wherein said first control means is a microprocessor.

18. A system as claimed in claim 1 wherein said second control means is a computer server.

19. A system as claimed in claim 2 wherein said second control means is a computer server.

20. A system as claimed in claim 14 wherein said information is a home page on said server.

21. A management apparatus for electrical apparatus including:
a control means on said apparatus;
a sensor on said apparatus communicating information about said apparatus to a microprocessor;
said microprocessor adapted to communicate with a server, said server accessible through the Internet and having a homepage which reflects the status of said apparatus wherein when the status of the apparatus changes, the homepage is changed to reflect the new status and when the homepage is changed the apparatus is controlled and changed to reflect the new status.

22. A household electrical appliance controller including:
a controller associated with each said appliance providing status and control information of each electrical appliance;
said controller adapted to communicate with a server accessible through the Internet, said server including a homepage displaying said status information wherein when the status of the apparatus changes, the homepage is changed to reflect the new status and when the homepage

is changed the apparatus is controlled and changed to reflect the new status.

23. A method of monitoring and controlling a plurality of apparatus through the Internet including:

controlling and monitoring said apparatus by a microprocessor,
accessing said microprocessor through a communication
network from a server accessible on the Internet;

providing said server with a homepage with updated information
from said microprocessor; and

changing said homepage which results in said server
communicating said change to said microprocessor which in turn changes
said status of said apparatus.

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS (37 CFR 1.9(f) AND 1.27 (b)) - INDEPENDENT INVENTOR**

Docket No.
1849-C

Serial No.
Not yet known

Filing Date
Filed Herewith

Patent No.

Issue Date

Applicant/ **NGO, Get Sen and PARSONS, Ewan**
Patentee:

Invention: **INTERNET UTILITY INTERCONNECT METHOD AND MEANS**

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled above and described in:

- ☒ the specification to be filed herewith.
☐ the application identified above.
☐ the patent identified above.

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- ☐ No such person, concern or organization exists.
☒ Each such person, concern or organization is listed below.

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities (37 CFR 1.27)

FULL NAME **EHOME CORPORATION PTY LIMITED**
ADDRESS **239 Magill Road, Maylands, South Australia 5067, Australia**
☐ Individual

☒ Small Business Concern

☐ Nonprofit Organization

FULL NAME
ADDRESS
☐ Individual

☐ Small Business Concern

☐ Nonprofit Organization

FULL NAME
ADDRESS
☐ Individual

☐ Small Business Concern

☐ Nonprofit Organization

FULL NAME
ADDRESS
☐ Individual

☐ Small Business Concern

☐ Nonprofit Organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF INVENTOR Get Sen NGO

SIGNATURE OF INVENTOR [Signature] 12 May 2000

NAME OF INVENTOR Ewan PARSONS

SIGNATURE OF INVENTOR [Signature] 12 May 2000

**SIGN
HERE
SIGN
HERE**

NAME OF INVENTOR _____

SIGNATURE OF INVENTOR _____

DATE: _____

NAME OF INVENTOR _____

SIGNATURE OF INVENTOR _____

DATE: _____

NAME OF INVENTOR _____

SIGNATURE OF INVENTOR _____

DATE: _____

NAME OF INVENTOR _____

SIGNATURE OF INVENTOR _____

DATE: _____

NAME OF INVENTOR _____

SIGNATURE OF INVENTOR _____

DATE: _____

NAME OF INVENTOR _____

SIGNATURE OF INVENTOR _____

DATE: _____

NAME OF INVENTOR _____

SIGNATURE OF INVENTOR _____

DATE: _____

NAME OF INVENTOR _____

SIGNATURE OF INVENTOR _____

DATE: _____

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) AND 1.27 (c)) - SMALL BUSINESS CONCERN			Docket No. 1849-C
Serial No. Not yet known	Filing Date Filed Herewith	Patent No.	Issue Date
Applicant/ NGO, Get Sen and PARSONS, Ewan Patentee:			
Invention: INTERNET UTILITY INTERCONNECT METHOD AND MEANS			
<p>I hereby declare that I am:</p> <p><input type="checkbox"/> the owner of the small business concern identified below:</p> <p><input checked="" type="checkbox"/> an official of the small business concern empowered to act on behalf of the concern identified below:</p> <p>NAME OF CONCERN: EHOME CORPORATION PTY LIMITED</p> <p>ADDRESS OF CONCERN: 239 Magill Road, Maylands, South Australia 5067, AUSTRALIA</p> <p>I hereby declare that the above-identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.</p> <p>I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the above identified invention described in:</p> <p><input checked="" type="checkbox"/> the specification filed herewith with title as listed above.</p> <p><input type="checkbox"/> the application identified above.</p> <p><input type="checkbox"/> the patent identified above.</p> <p>If the rights held by the above-identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed on the next page and no rights to the invention are held by any person, other than the inventor, who could not qualify as an independent inventor under 37 CFR 1.9(c) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).</p>			

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- ☒ no such person, concern or organization exists.
☐ each such person, concern or organization is listed below.

FULL NAME

ADDRESS

☐ Individual☐ Small Business Concern☐ Nonprofit Organization

FULL NAME

ADDRESS

☐ Individual☐ Small Business Concern☐ Nonprofit Organization

FULL NAME

ADDRESS

☐ Individual☐ Small Business Concern☐ Nonprofit Organization

FULL NAME

ADDRESS

☐ Individual☐ Small Business Concern☐ Nonprofit Organization

Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING:

GET SEN NSO

TITLE OF PERSON SIGNING

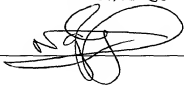
DIRECTOR

OTHER THAN OWNER:

ADDRESS OF PERSON SIGNING:

9-3 Orange Lane
 Norwood SA 5067
 Australia

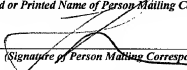
SIGNATURE:



DATE:

12-5-2000

SIGN

CERTIFICATE OF MAILING BY "EXPRESS MAIL" (37 CFR 1.10) Applicant(s): NGO, Get Sen and PARSONS, Ewan			Docket No. 1849-C	
Serial No. Not Yet Known	Filing Date Filed Herewith	Examiner 422 Rec'd PCT/PTO	Group Art Unit 1 9 OCT 2000	
Invention: INTERNET UTILITY INTERCONNECT METHOD AND MEANS				
<p>I hereby certify that the following correspondence:</p> <div style="border: 1px solid black; height: 50px; margin: 10px 0;"></div> <p style="text-align: center;"><i>(Identify type of correspondence)</i></p> <p>is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 in an envelope addressed to: The Assistant Commissioner for Patents, Washington, D.C. 20231 on</p> <div style="display: flex; align-items: center; margin-top: 10px;"> <div style="text-align: center; margin-right: 20px;"> <u>10/19/00</u> <i>(Date)</i> </div> <div style="flex-grow: 1;"></div> </div> <div style="text-align: right; margin-top: 20px;"> <div style="margin-bottom: 10px;"> <u>Fiona Ferguson</u> <i>(Typed or Printed Name of Person Mailing Correspondence)</i> </div> <div style="margin-bottom: 10px;">  <i>(Signature of Person Mailing Correspondence)</i> </div> <div> <u>EL531731278US</u> <i>("Express Mail" Mailing Label Number)</i> </div> </div>				
Note: Each paper must have its own certificate of mailing.				

7/prds.

09/673885

422 Rec'd PCT/PTO 19 OCT 2000

1

Internet utility interconnect method and means

FIELD OF THE INVENTION

5

The present invention relates to a method and an apparatus employing said method providing a virtual link interconnecting on-line database records to automation apparatus.

10 BACKGROUND OF THE INVENTION

It is well known to control or access a variety of apparatus in a home or a commercial environment through an electronic network, whether that be through existing telecommunication lines, by radio control or through electrical supply lines. One of the more common uses is to access various utilities, such as electrical or gas meters, or security apparatus. To achieve this, it is necessary to have an intelligent controlling means in the home or commercial environment that can be externally accessed to allow for immediate control or access to various apparatus. The difficulty with this is that to ensure one can effectively have access into the home or commercial environment, a dedicated connection into the home or commercial environment is necessary. The infrastructure necessary as well as the expense of a dedicated communication line is prohibitive to most users and utilities.

25 It is an object of the present invention to overcome at least some of the abovementioned problems or to provide the public with a useful alternative. This is achieved by providing a method and apparatus for a virtual link interconnecting on-line database records to automation apparatus and that is adapted to use different types of message protocols.

30

SUMMARY OF THE INVENTION

Therefore in one form of the invention there is proposed a system for the remote control of at least one electrical apparatus said system including:

35

a first control means adapted to communicate with said apparatus;

a second control means adapted to communicate with said first control means, said first control means further adapted to communicate with said second

control means;

said second control means including a dynamic memory storing information about the status of said electrical apparatus and including an input means enabling said status to be altered:

- 5 wherein when said status has been altered the second control means communicates electrical apparatus has been altered the new status is communicated to the first control means and to the second control means, said second control means altering the dynamic memory to reflect the status of the apparatus.

- 10 In a further form of the invention there is proposed a system for the remote access of at least one utility meter said system including:

a first control means adapted to communicate with said meter;

a second control means adapted to communicate with said first control means, said first control means further adapted to communicate with said second control means;

- 15 said second control means including a dynamic memory storing information about the status of said meter wherein said status is updated by the first control means communicating said new status to said second control means status and wherein when the status of said meter has been altered the new status is communicated to the first control means and to the second control means, said
20 second control means altering the dynamic memory to reflect the status of the meter.

Preferably said information is security protected from access by unauthorised persons. This can be achieved by well known password and computer software protection techniques.

- 25 Preferably said meter information is further accessible by the appropriate utility authority through said second control means. Thus, for example, the gas company may be able to access information about the use of gas at a property and can use that data for charging the customer. In addition, control of the meter may allow the gas company to shut down the flow of gas as may be necessary in
30 an emergency or during period of high demand. There could however be a proviso for a user to override the utility companies control.

- Preferably said second control means communicates to said first control means via the Internet. Since the Internet is already a well established network with known protocols and security and is accessible from almost anywhere in the world this
35 allows a user to control their own appliances in the home from virtually anywhere

whilst providing appropriate security.

Alternatively the second control means communicates with said first control means via an electrical power distribution means. In addition, the communication may be through any means such as cellular phone, radio network and the like.

- 5 Preferably said second control means receives regular status updates from said first control means. These updates preferably occur at regular pre-determined temporal intervals. For example, the system could be updated every 30 minutes. The update time could also change according to the time of day and the like. Thus, at night, the system may need to update only every couple of hours
- 10 whereas during the day it may occur at intervals of even a few minutes.

Preferably said updates occur continuously.

In preference said status includes information such as control information, management information and service information of said apparatus. This then allows the user to know all of the information that is available.

- 15 In preference first control means is a microprocessor. This means that a home user does not need to provide for a computer to control their appliance. It can be a simple electronic microprocessor which obviously reduces the cost significantly and avoids the necessity to provide not only support for the home computer but continual upgrades.
- 20 In preference second control means is a computer server. This a single server could provide use for thousands of home users. Preferably said information is a home page on said server which is easily accessible through the Internet.

In a yet further form of the invention there is proposed a management apparatus for electrical apparatus including:

- 25 a control means on said apparatus;
a sensor on said apparatus communicating information about said apparatus to a microprocessor;
said microprocessor adapted to communicate with a server, said server accessible through the Internet and having a homepage which reflects the
- 30 status of said apparatus wherein when the status of the apparatus changes, the homepage is changed to reflect the new status and when the homepage is changed the apparatus is controlled and changed to reflect the new status.

In a still further form of the invention there is proposed a household electrical appliance controller including;

a controller associated with each said appliance providing status and control information of each electrical appliance;

- 5 said controller adapted to communicate with a server accessible through the Internet, said server including a homepage displaying said status information wherein when the status of the apparatus changes, the homepage is changed to reflect the new status and when the homepage is changed the apparatus is controlled and changed to reflect the new status;

- 10 In a still further from of the invention there is proposed a method of monitoring and controlling a plurality of apparatus through the Internet including:

controlling and monitoring said apparatus by a microprocessor,

accessing said microprocessor though a communication network from a server accessible on the Internet;

- 15 providing said server with a homepage with updated information from said microprocessor; and

changing said homepage which results in said server communicating said change to said microprocessor which in turn changes said status of said apparatus.

20

BRIEF DESCRIPTION OF THE DRAWINGS

To assist in understanding the invention reference is made to the following figures in which;

25

Figure 1 is a flow chart of the method of the present invention;

Figure 2 is a schematic diagram of a network employing the invention;

30

Figure 3 is a schematic diagram of the invention in conjunction with security arrangements;

Figure 4 is a schematic diagram showing the broad concept of the invention when used by utilities;

35

Figure 5 is a typical on-screen display that may be used by a home owner;

Figure 6 is a typical on-screen display in relation to an environment control center; and

Figure 7 is a typical on-screen display in relation to a security control centre.

BEST MODES OF CARRYING OUT THE INVENTION

To further assist in understanding the invention reference is made to the following descriptions which should be read in conjunction with the accompanying drawings.

Intranet protocol

The invention relates to a method and an apparatus employing that method wherein a master webserver is connected to remote slave nodes using an appropriate protocol for control and automation over networks of different media including wire, radio, microwave and powerlines.

The arrangement that acts like a virtual Internet link (VIL) which therefore responds to requests from the server and remotes to replicate information as though the remote node is connected to the Internet. The virtual link can be used for remote information reading as well as home automation and security reflected in the master server. Remote nodes can act on the Internet database information through a master/slave/exception protocol supporting automation, metering, security, electronic cash transfers and Internet URL (Universal Resource Location) requests.

In one embodiment of the invention a master/slave polling message establishes an event which is used to schedule any waiting exception message to be transmitted. The system features a master and slave architecture for initiating reception of secure Internet messages from any node. Each node may be polled systematically, by the server, which then replicates the data between the related database record and the slave node. As a result of this arrangement the data transmission protocol establishes a virtual link to the Internet for remote metering, information, automation, security, control and electronic commerce in the home or

business. In addition the protocol allows messages to be forwarded to Internet service providers via the server to be able to surf the Internet via the eLink connection.

5 The invention allows, for example, the energy consumption from a mains electrical power supply to be measured at the remote node and a deduction of appropriate payments for subscribers according to authorised preprogrammed rates. A virtual Internet link allows for bi-directional secure
10 electronic payments so that the attached smartcard and e-cash devices can debit or credit approved payments. The automatic remote metering and control protocol is defined for communication between remote nodes and an on-line database web server (eg. Utility Gateway) which may communicate through data collection units supporting protocol conversion. A World Wide
15 Web browser can monitor and control devices in homes and businesses via the utility server and slave nodes using the virtual link enabled by this described method and protocol.

Combined Transfer Media Functionality

20 In a further embodiment of this invention there is proposed a method for operating a remote control and monitoring system that replicates data between a host computer located at a central server site and a set of automation nodes located at a remote site. The replicating protocol provides a virtual link between the said remote site to said central website, and
25 includes;

- means to monitor said data such as utility meter readings, security, finance and Internet requests; and
- means to link the data collected for subsequent access via the Internet

30 The system can communicate with a central server over existing wire and wireless communication systems, such as local telephone, cellular phone, radio, powerlines, landline, leased line, dial-up modem links and cable interfaces. The protocol may operate in a half-duplex mode over single transmission pair.
35

Local Electronic Billing and Payment

A further advantage of the system is that once information is known, the system may provide a gateway to advanced consumer services at the remote location including prepayment systems. For example the system could be used for an energy billing system for charging the energy usage of a metered device in accordance with a downloaded authorised rate schedule from a webserver. Each predefined rate schedule can define different times periods and amounts of payment deductions directly from an e-cash The schedule of rates and periods form part of the VIL protocol which also supports the transmission of the metered utility consumption.

Back-Channel Web Browsing

A further advantage of the invention is that it can act as a service agent for fulfilling requests of a web browser client coupled to a local PC, Digital or Web TV set-top interface. This method of transmission of simplex Internet requests, mainly URL addresses is unique through exception messaging in combination with master/slave polling of automation and/or metering information to the server. The one way simplex operation provides a back-channel capability for utility providers to deliver interactive services for their subscribers. Security, local government and on-line information providers are regarded as utilities in addition to the traditional providers of water, gas, electricity and telephone services. Under this scheme each home has a equivalent IP address on the system and the remote node can send a request within the protocol.

With this back-channel capability URL's are sent from the home to broadcast Internet providers supporting web browsing from TV cable and satellite downfeeds. A feature of the protocol is the reversal of the high integrity polled data which has low priority in response time combined with the low integrity Internet requests which gets the highest priority for speed of transmission. In this way the protocol can connect homes to the Internet through URL requests from set top boxes to their broadcast TV service provider. The utility server can act as a half duplex server that is specifically designed to pass Internet requests to broadcast systems. With very little additional overhead to automated metering a utility provider can forward

subscriber Internet data requests to a broadcast service provider who can transmit Internet data to a browser running on a PC or TV with an Internet address.

5 Internet Control

The invention also provides a method of controlling devices attached to remote nodes provided through the Internet by the virtual linking of data records in the master web server. Under this arrangement each remote node has a virtual Internet address which is replicated from the server database. The web server can have the capability to be changed by authorised users though the Internet using a range of available commercial technologies. The database fields in the records (including security and air-conditioning controls) are dynamically linked to the remote nodes (automation interface node) by the VIL Protocol using a master/slave polling method with error checking to ensure integrity. This enables residents and other subscribers to turn on a range of connected devices in the home or work premises using the Internet.

20 Replication through sub-networks

Data concentrators may be of a type that use the same communication protocols as the remote nodes. This provides a means to route messages to a destination node through a second network and still maintain the virtual link between the server and the remote node, Data Concentrators are routers used to speed up communications in systems with many slaves. Each Data Concentrator replicates communication to a group of slaves through one communication port and acts as a large slave through the second port. The software then replicates the second port as if it were a large slave with increased speed.

The Data Concentrator or Replicator can act as a Protocol Converter and communicate with the server using a higher speed communication channel using a variety of protocols yet maintaining the overall virtual Internet Link protocol between master server and slave node. The Data Concentrators can communicate with the slave devices using dial-up telephone, leased line, microwave, radio or satellite interfaces. Additional wide area or local area

network interfaces can be used. A store and forward feature allows any Data Concentrator to relay a message to another when direct re-transmission is not possible. The data concentrator can be used to pass on or relay the message in both directions.

5

Exception Messaging

In another embodiment the present invention provides for a method to support exception message transmission from the slave node when a request is initiated. When such a request is detected the slave unit initiates a transmission to the Master unit and transfers that data. Timing is used to avoid potential collisions using the slave address to do this. Before any unit transmits it must first detect if any other unit is transmitting. This is achieved by detecting the break in the polled transmission and if another exception transmission is detected it delays until the end of the next polled transmission before it tries again. When multiple slaves require transmission at the same time an avalanche effect can result causing erratic system operation and sometime system failure. To cope with this a fall back process is used so that if after all possible attempts send the message caused by the exceptions have failed, each slave stops trying to transmit and waits until polled by the master.

The present invention thus relates to a method for a virtual link, hereinafter referred to as eLink interconnecting online database records to automation apparatus using a different type of message protocol with embedded URL's referenced to international standard addresses for home and business devices. The new protocol allows for utility load shedding over the Internet where the utilities may include water, gas, electricity, telecommunications, security and the Internet.

30

In a preferred embodiment there is provided a method for a virtual link interconnecting online database records to automation apparatus using a different type of message protocol with embedded URL's referenced to international standard database addresses for home and business devices. eLink protocol allows for utility load shedding over the Internet. Utilities include water, gas, electricity, telecommunications, security and Internet. eLink establishes a virtual link to the Internet for metering, information, automation, security, control and electronic commerce in the home or business. In addition Internet request messages can be forwarded to Internet service

35

providers via eLink. eLink collects data from the special purpose eHub automation interface in the home. This is based on embedded internet protocols IP associated with each microprocessor automation interface (eHub).

- 5 At the other end, eLink is able to connect with a secure Web Server database. The database uses IP extended addressing to map each device in the home into internet address space and is used to collect utility data from remote meters, as well as hold the status of each device for remote access over the internet.
- 10 Each home owner is represented by encrypted records in the data base, and access to relevant fields is available to each participating utility. This is illustrated in Figure 1 where the desired home appliances or utilities are mirrored on an external server. eLink provides each home owner with access to their specific meter reading data that has been collected in the data base. eLink can also provide each utility with access to
- 15 its specific data in the data base. eLink thus provides the basis for both home owners and utilities to share and monitor utility resource usage.

- Home owners can also perform other home based transactions and access the Internet using eLink. Transactions may be initiated from the home or any other location
- 20 with an Internet connection. In particular, the home owner can initiate requests for data to be sent via cable or satellite to the TV in the home. This allows for datacasting and multicasting requests to be serviced over the utility infrastructure.

- It may be noted that in the home, eHub works with all a range of home management
- 25 and remote devices including C-Bus, X10, CE-Bus, I-wire and other protocols which may be multiplexed through eHome wiring network in the home. eLink assists utilities to develop systems for automatic meter reading and load shedding leading using the internet. This leads to prompt payment or prepayment systems based on ecommerce from the webserver databases.

- 30 eLink is a virtual link replicating online database records to the eHub automation interface in the home. eLink is used for remote information reading as well as home automation and security replicated in the webserver. The media independent eLink network connection with the home, exchanges URL information supporting
- 35 automation, metering, security, ecommerce transfers and Internet backchannel requests.

eLink is designed to work with a range of home management systems and devices.

eLink will support with industry standards such as CEBus and Universal Plug and Play through cross matching standard addresses into the eLink URL message structure.

- The automatic remote metering and control protocol provides communication between the eHub and an online database web server (eg. Utility Gateway). This enables the home owner to monitor and control devices in home via a web browser either in the home or remotely through the Internet, examples of this shown in Figure 5 where a home owner may access any one of a number of control panels such as appliance, security, environment or utilities. Once a particular panel is chosen, such as the environment in Figure 6 and security in Figure 7 the home owner can change control different systems. Thus, the home owner can turn the air conditioner on, and next time that the server updates the eHub the actual command is executed in the home.
- In the future this allows each home to have a equivalent IP address without a PC in the home as it resides on the Utility Gateway server. The remote eHub node can send a request within the protocol. With this backchannel capability, URL's can be sent from the home to broadcast Internet providers supporting web browsing from TV via cable and satellite broadcast services. This feature can connect homes to the Internet through URL requests from eHome's to their broadcast TV service provider. The utility server can act as a half duplex server that is specifically designed to pass Internet requests to these broadcast providers. By using very little additional overhead to automated metering, a utility provider can forward subscriber Internet data requests to a broadcast service provider who can transmit Internet data to a browser running on a PC or TV with an Internet address.

- Remote control is provided through the Internet by the linking of data records in the gateway Web Server. Under this arrangement each remote node has a virtual Internet address which is replicated from the server database. The home record in the server has the capability to be changed by authorised users though the Internet using eCommerce security methods (eg name & password or digital signature). The database fields in the records (including security and air-conditioning controls) are dynamically linked to the automation interface to enable residents and valid subscribers to turn on a range of connected devices in the home using the Internet.

The eHub control panel, designed for the home, will provide a convergent point of access to phone, water, gas, electricity, Internet and security services.

The eHome system may handle totalising counts from electricity, water and gas meters with pulsed or digital outputs including protection against tampering with the inputs. Interface to existing home automation systems is achieved through digital I/O and serial ports which allow for optional connection to a PC including providing a shared modem facility in the home.

The master/slave polling message establishes an event which is used to schedule any waiting exception message to be transmitted after a programmable time delay. The eLink system features a master and slave architecture for initiating reception of secure Internet requests messages from any node. Each node may be polled systematically, on a virtually continuous or periodic basis, by the server, which then replicates the data between the related database record and the addressed slave node. As a result of this arrangement the data transmission protocol establishes a virtual link to the Internet for remote metering, information, automation, security, control and electronic commerce in the home or business. In addition the protocol allows messages to be forwarded to Internet service providers via the server to be able to surf the internet via the eLink connection.

The energy consumption measured at the remote node may deduct e-cash payments for subscribers according to authorised pre-programmed rates. The virtual Internet link allows for bi-directional secure electronic payments so that the attached smartcard and e-cash devices can remove debit or provide credit approved payments. The automatic remote metering and control protocol is defined for communication between remote nodes (eg. eHub) and an online database web server (eg. Utility Gateway) which communicate through data collection units supporting protocol conversion. A World Wide Web browser can monitor and control devices in homes and businesses via the utility server and slave nodes using the virtual link enabled by this defined described method and protocol.

A Utility Gateway Server, includes a computer which is connected to the Internet and the remote nodes through a data concentrator multiplexer unit for generation of commands and the receipt of data over communication lines. The commands generated by the server contain an address portion and a command message portion.

There is an eHub automation interface node located at each customer residence. Each automation interface node is capable of selectively communicating with a plurality of utility meters and attached devices, for selectively driving a plurality of devices at a

customer residence, for monitoring the status of a plurality of external contacts, and for selectively providing a plurality of alarms and messages to the customer. Each node includes a receiver for receiving commands from the server over a plurality of communication lines as well as a transmitter for transmitting return messages to the server over the same communication line. In order to increase the through-put capability, the protocol allows priority to requests for Internet addresses over commands for meter reading and security transfers.

The present invention thus provides a remote automatic meter reading, control and security system as a background activity. It may further provide an automatic utility payment system, with encrypted security, for payment of the measured reading of a consumed commodity using a range of electronic commerce methods accepted by the consumer and the utility. Yet further it may provide a remote automatic meter reading, control and customer alert system incorporating controls for improving the energy management of utility services by customer usage and exception reporting, as well as assuring that loads which have been authorised to be turned off by the system will once again be turned on.

Still further still the invention may provide a master/slave command and message interlaced with customer event requests whereby the data throughput for Internet requests is enhanced. Yet further still the present invention may provide a meter reading, control and security system incorporating polled message formats in order to provide high integrity of customer billing information, security system operation and electronic funds transfer to the server database.

eLink is a unique IP based protocol for home automation using powerlines, telephone wire and radiowireless media. Under this scheme each home has an IP address on a server database with utility fields (including security and air-conditioning controls) dynamically linked to the home embedded controller (eHub automation interface node) using a master/slave polling with Internet IP embedded protocol. IP addresses can be sent from the home for supporting Internet web browsing.

This eLink protocol would run on a range of hardware including the eHub in the home where it can connect to lighting, environment and entertainment networks. e-cash controls can be transferred in both directions and the protocol is suitable for industrial telemetry applications.

The Home Management System includes utility billing and control via the Internet.

Each home has a equivalent TCP/IP address like a street address and crossed referenced to the telephone number. The protocol includes security and authorised access to standards accepted for electronic commerce. The eLink protocol is an efficient communications scheme to provide a virtual link to connect a record in the server database to a number of services in the home.

Embedded controller technology in the automation interface provides an in-home local-area network (LAN) that can control home appliances and services that implement multiple protocols in addition to the virtual link to the Utility gateway server.

Each household can use a set-top box or PC as a terminal for interfacing the automation interface with major home appliances and consumers. eLink allows telemetry to function over radio, powerlines landline, leased line, dial-up modem links and cable interfaces such as RS232, RS422, RS485. Via external converters it is also possible to link units via fibre optic.

eLink can be used for SCADA (Supervisory control and data acquisition) systems where SCADA refers to the combination of the fields of telemetry and data acquisition encompassing the collection of the information, transferring it back to a central site, carrying out any necessary analysis and control and then displaying this data on a number of operator screens.

The server as master makes regular, repeated requests for data to each slave (eHub) in sequence, writing the data to each unit and reading that unit's data back in response. This is a half duplex protocol where the slave only responds to a request from the master. Each slave unit has a unique address or identification number based on IP sub-addressees to allow this to function correctly. If the slave does not respond within a defined time, the master will retry again (up to a configurable number of retries) and then carries on polling the other units in the system. It is possible to retry that unit again on several more re-transmissions before marking it as failed link after which the master will only poll it once each poll period to enable a restored link to be detected.

To overcome some of the following disadvantages in polled systems eLink can use sub-master networks so that there are several small, fast messages which can be received by the server master in between polled messages.

- Normally the interrupt type requests from a slave requesting urgent action cannot be handled within master/slave protocols.
- Systems which are lightly loaded with minimum data changes from a slave are quite inefficient and unnecessarily slow

eLink supports Report By Exception as the slave station monitors its own inputs for a request for Internet data. When such a request is detected the slave unit initiates a transmission to the Master unit and transfers that data. Timing is used to avoid potential collisions using the slave IP sub address to do this. Before any unit transmits it must first detect if any other unit is transmitting. This can be done by detecting the break in the polled transmission and another exception transmission is detected transmission a delay is required until the end of the next polled transmission before it tries again. When multiple slaves require transmission at the same time an avalanche effect can result causing erratic system operation and sometime system failure. To cope with this a fall back process is used so that if after all possible attempts send the message caused by the exceptions have failed, each slave stops trying to transmit and waits until polled by the master.

The advantages of this are:

- It reduces the unnecessary transfer of data at any particular time as in polled systems.
- URL requests are detected quickly.

Internet addresses are assigned to slave nodes on the Internet server which is the master for the network. Each host gateway server must have its own Internet address and support sub-addresses for each slave node. A database is normally used for Address Resolution and storage of information exchanged with each slave. It should also translate Internet addresses to Ethernet addresses when needed with LANS and WANS.

eLink protocol runs over a variety of network media: IEEE 802.3 (ethernet) and 802.5 (token ring) LAN's, X.25 lines, satellite links, and serial lines. There are standard encapsulations for eLink packets defined for many of these networks. Serial Line eLink, is used for master/slave serial connections using wire and wireless media.

eLink defines a sequence of characters that frame data packets on a serial line. It provides addressing, packet type identification, error detection/correction and compression mechanisms.

eLink is used for automation applications. It supports URL requests to connect homes to the Internet through a secure webserver. The utility server can act as a half duplex server that is specifically designed to pass Internet requests to broadcast systems. With very little additional overhead an utility server can

forward customer data requests to a broadcast service provider who can transmit Internet data to a browser running on a PC or TV with an Internet address.

eLink Wire Cable

- 5 Peripheral monitoring devices such as movement detectors have traditionally been connected to a host by means of four core cable. The advent of low cost cameras and the image handling capability of eHome means that video surveillance will increasingly be used. eLink uses eight core Category 5 cable via RJ45 plugs and sockets to
10 connect peripheral devices to eHub remote nodes.

To allow manufacturers of peripheral devices to ensure their products are compatible with eHome and directly connectable to eHub nodes the following wiring printout is defined using any colours in the designated order by the following table:

15

Wire colour	Function	Cat5 pin
White/green	Video / AC	1
Green	Video /AC	2
White/orange	+12V	3
Blue	+5V	4
White/blue	eLink	5
Orange	Ground	6
White/brown	Signal / eLink Back Channel	7
Brown	Tamper / eLink Back Channel	8

Thus, the present invention also provides a master wiring key configuration for multiple use of Category cable as defined by the eLink wire printout definition which is combined with unique numbers for each device on pin 3.

20

Embedded URL Address

25

eLink uses an embedded IP protocol with 128-bit addressing, allowing for an expanded addressing scheme involving sub-addressing. eLink uses the 128-bit address as follows:

No of bytes Description

	0-3	Standard IP Address
	4-7	Customer ID, 10-digit phone number in binary, for example
5	8-11	Bit – cross-referenced to tables for Contact ID, CEBus Number, X10 Address, Status, enabling and command
	12-15	Operator – set as a value, giving and on/off status and values eg temperature readings, and meter readings.

10 The 128-bit address structure of eHome comprises a main address and three sub-addresses. Each address has specific significance to a Web browser:

A virtual link is created from the database to the device. eLink devices could be any or all of the following:

- Security Camera
- 15 • Air conditioner, heating unit, lights, and other connected devices
- Utility Meters for Electricity, Gas, Water and Recycled Water
- Energy Management Control

20 The database itself is stored on a secure web server, and accessed through a website. The application (1) running continuously scans the database, checking for any updates, modifications, new or deleted entries, etc.

25 When a client wished to access their home through the website, a message (2) is sent from the application to the modem connected to the web server. The message can be in the form of:

- A Secure eLink Message via E-mail
- A Dial-up Connection via modem using TCP/IP
- Direct Internet Connection using TCP/IP (ie. not through E-mail)
- Or Another Form such as radio and powerlines

30 Each house that has eHome installed uses a modem, which is connected through the Security System. The message is received by this modem, which sends it over the CEBus, or other transmission media to devices connected to the eHub.

35 If eHub is also connected to a computer, this receives the message and initiates corresponding actions to devices in the home. The message contains information to perform functions or gather information for these devices in the home. These include:

- Security Camera Pictures

- Turning on/off devices
- Reading Utility Meters
- Energy Control reading and change of mode setting

5 Internet protocol V6

10 The present invention is particularly useful when the new Internet Protocol, Version 6 (IPv6) will become the standard. IPv6 is designed to be a simple, forward-compatible upgrade to the existing version of IP. This upgrade is also intended to resolve all of the weaknesses that IPv4 is currently manifesting, including the shortage of available IP addresses, the inability to accommodate time-sensitive traffic, and its lack of network layer security.

15 The next generation of IP, commonly known as IPng but more correctly identified as IPv6, offers a vastly expanded addressing scheme to support the continued expansion of the Internet, and an improved ability to aggregate routes on a large scale.

20 IPv6 also supports numerous other features, such as real-time audio or video transmissions, host mobility, end-to-end security through network layer encryption and authentication, as well as auto-configuration and auto-reconfiguration. It is expected that these services will provide ample incentive for migration as soon as IPv6-capable products become available. Many of these features still require additional standardization. Therefore, it would be premature to expound upon them at any great length.

25 The one aspect of IPv6 that can, and should, be expounded upon is its addressing. IPv4's 32-bit address length gave the protocol a theoretical capability to address 2^{32} or about 4 billion devices. Inefficient subnet masking techniques, among other wasteful practices, has squandered this resource.

30 IPv6 uses a 128-bit address and is theoretically capable of 2^{128} power times the size of the IPv4 address space. This equals 340,282,366,920,938,463,374,607,431,768,211,456 mathematically possible addresses. Only about 15 percent of this potential address space is currently allocated. The remainder is reserved for future use and includes the capacity for eLink messages by direct IP mapping of devices in the home.

CLAIMS

- 5 1. A system for the remote control of at least one electrical apparatus said system including:
- a first control means adapted to communicate with said apparatus;
 - a second control means adapted to communicate with said first control means, said first control means further adapted to communicate with said second control means;
- 10 said second control means including a dynamic memory storing information about the status of said electrical apparatus and including an input means enabling said status to be altered:
- wherein when said status has been altered the second control means communicates said new status to said first control means which
- 15 subsequently checks the status of said apparatus and alters it if necessary to be the same as the new communicated status and wherein when the status of said electrical apparatus has been altered the new status is communicated to the first control means and to the second control means, said second control means altering the dynamic memory to reflect the
- 20 status of the apparatus.
2. A system for the remote access of at least one utility meter said system including:
- a first control means adapted to communicate with said meter;
- 25 a second control means adapted to communicate with said first control means, said first control means further adapted to communicate with said second control means;
- said second control means including a dynamic memory storing information about the status of said meter wherein said status is updated by the first control means communicating said new status to said second control
- 30 means status and wherein when the status of said meter has been altered the new status is communicated to the first control means and to the second control means, said second control means altering the dynamic memory to reflect the status of the meter.

3. A system as in either claim 1 or claim 2 wherein said information is security protected from access by unauthorised persons.
4. A system as in claim 2 wherein said meter information is further accessible by the appropriate utility authority through said second control means.
5. A system as in claim 4 wherein said utility authority can control said utility meter.
6. A system as in any one of the above claims wherein said second control means communicates to said first control means via the Internet.
7. A system as in either claim 1 or claim 2 wherein said second control means communicates with said first control means via an electrical power distribution means.
8. A system as in any one of the above claims wherein said second control means receives regular status updates from said first control means.
9. A system as in claim 5 wherein said updates occur at regular pre-determined temporal intervals.
10. A system as in claim 5 wherein said updates occur continuously.
11. A system as in any one of the above claims wherein said status includes information such as control information, management information and service information of said apparatus.
12. A system as in claim 1 wherein said first control means is a microprocessor.
13. A system as in any one of the above claims wherein said second control means is a computer server.
14. A system as in claim 10 wherein said information is a home page on said server.
15. A management apparatus for electrical apparatus including:
 - a control means on said apparatus;
 - a sensor on said apparatus communicating information about said apparatus to a microprocessor;
 - said microprocessor adapted to communicate with a server, said

server accessible through the Internet and having a homepage which reflects the status of said apparatus wherein when the status of the apparatus changes, the homepage is changed to reflect the new status and when the homepage is changed the apparatus is controlled and changed to reflect the new status.

5 16. A household electrical appliance controller including;

a controller associated with each said appliance providing status and control information of each electrical appliance;

10 said controller adapted to communicate with a server accessible through the Internet, said server including a homepage displaying said status information wherein when the status of the apparatus changes, the homepage is changed to reflect the new status and when the homepage is changed the apparatus is controlled and changed to reflect the new status.

15 17. A method of monitoring and controlling a plurality of apparatus through the Internet including:

controlling and monitoring said apparatus by a microprocessor, accessing said microprocessor through a communication network from a server accessible on the Internet;

20 providing said server with a homepage with updated information from said microprocessor; and

changing said homepage which results in said server communicating said change to said microprocessor which in turn changes said status of said apparatus.

17. A household electrical appliance controller including;
a controller associated with each said appliance providing status and control
information of each electrical appliance;
said controller adapted to communicate with a server accessible through the
Internet, said server including a homepage displaying said status information
wherein when the status of the apparatus changes, the homepage is changed
to reflect the new status and when the homepage is changed the apparatus is
controlled and changed to reflect the new status.
18. A method of monitoring and controlling a plurality of apparatus through
the Internet including;
controlling an monitoring said apparatus by a microprocessor;
accessing said microprocessor through a communication network from a
server accessible on the Internet;
providing said server with a homepage with updated information from said
microprocessor; and
changing said homepage which results in said server communicating said
change to said microprocessor which in turn changes said status of said
apparatus.
19. The system of Claim 2 or Claim 3 wherein said web-addressable link
permits transmission of at least portions of data contained in said memory to a
communication device connected to the Internet.
20. The system of Claim 19 wherein said web-addressable link permits a
user to change at least portions of said data contained in said memory by
means of said communication device.
21. The system of Claim 20 wherein said communication device is a
personal computer.
22. The system of Claim 20 wherein said communication device is a
personal digital assistant.

23. The system of Claim 20 wherein said communication device communicates with said memory by means of a wireless link.

24. The system of Claim 23 wherein said wireless link is a mobile telephone or cellular telephone network.

- 5 25. A protocol for a system for the remote control of at least one apparatus, said system including;
a first control means adapted to communicate with said apparatus;
a second control means adapted to communicate with said first control means;
said first control means further adapted to communicate with said second
10 control means;
said second control means including a memory storing information about the status of said apparatus and including an input means enabling said status to be altered;
wherein when said status has been altered the second control means
15 communicates said new status to said first control means which subsequently checks the status of said apparatus and alters it if necessary to be the same as the new communicated status and wherein when the status of said apparatus has been altered the new status is communicated to the first control means and to the second control means, said second control means altering
20 the memory to reflect the status of the apparatus;
said input means comprising a web-addressable link whereby a user can access said memory via the internet;
said protocol assigning a Web address to said at least one apparatus whereby said at least one apparatus is web-addressable independent of the nature of
25 the communications link between said first control means and said second control means.

26. The protocol of Claim 25 wherein said Web address is assigned via said second control means as a virtual address.

5

10

15

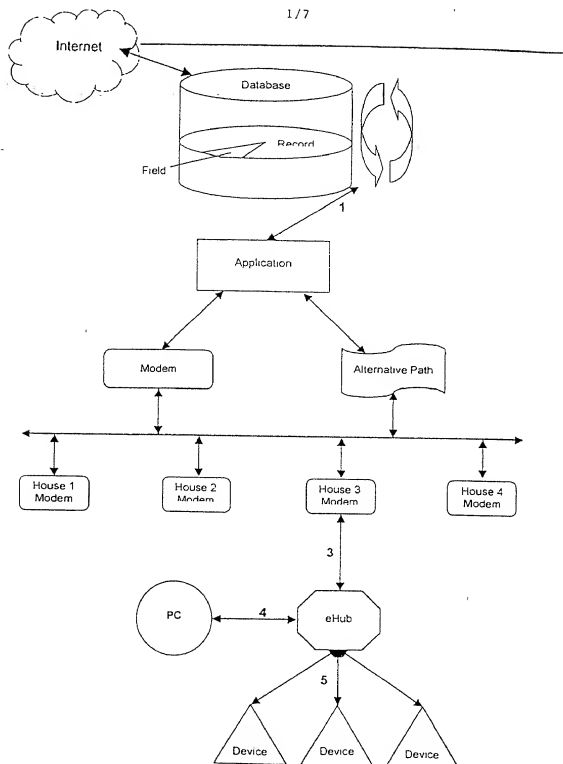


Fig 1

eHome Network Remote Control

2/7

09/673885

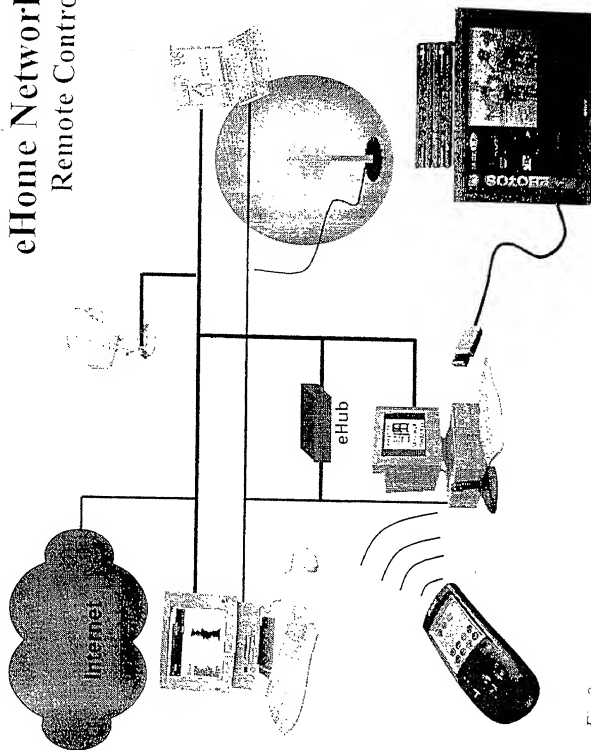


Fig 2

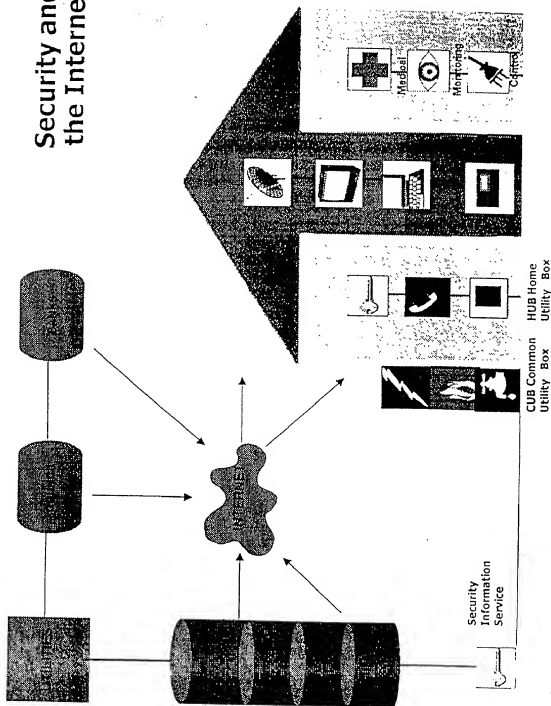
[illegible]

Fig 3

Secure Online Server

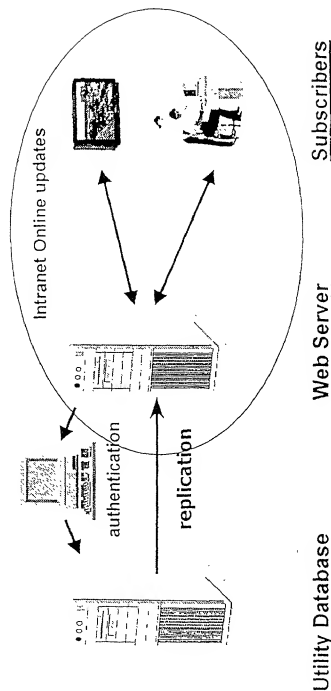


Fig 4



eHomeControlCentre

[Home] [Information Centre] [Home Management] [About Us]

Demonstration eHome Centre

View, alter and see live updates of your eHome

Home User: G. Brown 1991 Date: 18/05/98

Security Control Centre

Zone Monitoring On - On

Security System On - On

Fire Alarm System On - On

Video Patrol System On - On

Video Patrol System 2 On - On

Home User: G. Brown 1991 Date: 18/05/98

Appliance Control Centre

Kitchen Appliances On - On

Machine Control On - On

Front Backwash On - On

Large Boiler On - On

Front Windows On - On

Home User: G. Brown 1991 Date: 18/05/98

Appliance Control Centre

Front Windows On - On

Living Room Heating On - On

Living Room Lights On - On

Living Room Lights On - On

Living Room Lights On - On

Living Room Lights On - On

Living Room Lights On - On

Home User: G. Brown 1991 Date: 18/05/98

Appliance Control Centre

Front Windows On - On

Living Room Heating On - On

Living Room Lights On - On

Living Room Lights On - On

Living Room Lights On - On

Living Room Lights On - On

Fig 5



Date: 16/6/99

Environment Control Centre

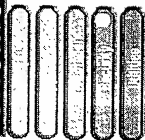
1

②



Click **Update** **button to change controls**

987J



Security

[[Entry]] Home [[Information Centre]] Home Management [[About Us]]

Home User ID: Demo2001

Date: 16/6/99

Security Control Centre

Alarm Monitoring ☐ On ☒ OffSecurity System ☐ On ☒ OffFire Alarm System ☐ On ☒ OffInfra Red Sensors 1 ☐ On ☒ OffInfra Red Sensors 2 ☐ On ☒ OffClick

button to change controls

Fig 7

Internet utility interconnect method and means

FIELD OF THE INVENTION

5

The present invention relates to a method and an apparatus employing said method providing a virtual link interconnecting on-line database records to automation apparatus.

10 BACKGROUND OF THE INVENTION

It is well known to control or access a variety of apparatus in a home or a commercial environment through an electronic network, whether that be through existing telecommunication lines, by radio control or through electrical supply lines. One of the more common uses is to access various utilities, such as electrical or gas meters, or security apparatus. To achieve this, it is necessary to have an intelligent controlling means in the home or commercial environment that can be externally accessed to allow for immediate control or access to various apparatus. The difficulty with this is that to ensure one can effectively have access into the home or commercial environment, a dedicated connection into the home or commercial environment is necessary. The infrastructure necessary as well as the expense of a dedicated communication line is prohibitive to most users and utilities.

15 It is an object of the present invention to overcome at least some of the abovementioned problems or to provide the public with a useful alternative. This is achieved by providing a method and apparatus for a virtual link interconnecting on-line database records to automation apparatus and that is adapted to use different types of message protocols.

30

SUMMARY OF THE INVENTION

Therefore in one form of the invention there is proposed a system for the remote control of at least one electrical apparatus said system including:

35 a first control means adapted to communicate with said apparatus;
a second control means adapted to communicate with said first control means, said first control means further adapted to communicate with said second

control means;

said second control means including a dynamic memory storing information about the status of said electrical apparatus and including an input means enabling said status to be altered:

- 5 wherein when said status has been altered the second control means communicates electrical apparatus has been altered the new status is communicated to the first control means and to the second control means, said second control means altering the dynamic memory to reflect the status of the apparatus.

- 10 In a further form of the invention there is proposed a system for the remote access of at least one utility meter said system including:

a first control means adapted to communicate with said meter;

a second control means adapted to communicate with said first control means, said first control means further adapted to communicate with said second control means;

- 15 said second control means including a dynamic memory storing information about the status of said meter wherein said status is updated by the first control means communicating said new status to said second control means status and wherein when the status of said meter has been altered the new status is communicated to the first control means and to the second control means, said
20 second control means altering the dynamic memory to reflect the status of the meter.

Preferably said information is security protected from access by unauthorised persons. This can be achieved by well known password and computer software protection techniques.

- 25 Preferably said meter information is further accessible by the appropriate utility authority through said second control means. Thus, for example, the gas company may be able to access information about the use of gas at a property and can use that data for charging the customer. In addition, control of the meter may allow the gas company to shut down the flow of gas as may be necessary in
30 an emergency or during period of high demand. There could however be a proviso for a user to override the utility companies control.

- Preferably said second control means communicates to said first control means via the Internet. Since the Internet is already a well established network with known protocols and security and is accessible from almost anywhere in the world this
35 allows a user to control their own appliances in the home from virtually anywhere

whilst providing appropriate security.

Alternatively the second control means communicates with said first control means via an electrical power distribution means. In addition, the communication may be through any means such as cellular phone, radio network and the like.

- 5 Preferably said second control means receives regular status updates from said first control means. These updates preferably occur at regular pre-determined temporal intervals. For example, the system could be updated every 30 minutes. The update time could also change according to the time of day and the like. Thus, at night, the system may need to update only every couple of hours
10 whereas during the day it may occur at intervals of even a few minutes.

Preferably said updates occur continuously.

In preference said status includes information such as control information, management information and service information of said apparatus. This then allows the user to know all of the information that is available.

- 15 In preference first control means is a microprocessor. This means that a home user does not need to provide for a computer to control their appliance. It can be a simple electronic microprocessor which obviously reduces the cost significantly and avoids the necessity to provide not only support for the home computer but continual upgrades.

- 20 In preference second control means is a computer server. This a single server could provide use for thousands of home users. Preferably said information is a home page on said server which is easily accessible through the Internet.

In a yet further form of the invention there is proposed a management apparatus for electrical apparatus including:

- 25 a control means on said apparatus;
a sensor on said apparatus communicating information about said apparatus to a microprocessor;
said microprocessor adapted to communicate with a server, said server accessible through the Internet and having a homepage which reflects the status of said apparatus wherein when the status of the apparatus changes, the
30 homepage is changed to reflect the new status and when the homepage is changed the apparatus is controlled and changed to reflect the new status.

In a still further form of the invention there is proposed a household electrical appliance controller including;

a controller associated with each said appliance providing status and control information of each electrical appliance;

- 5 said controller adapted to communicate with a server accessible through the Internet, said server including a homepage displaying said status information wherein when the status of the apparatus changes, the homepage is changed to reflect the new status and when the homepage is changed the apparatus is controlled and changed to reflect the new status;

- 10 In a still further form of the invention there is proposed a method of monitoring and controlling a plurality of apparatus through the Internet including:

controlling and monitoring said apparatus by a microprocessor,
accessing said microprocessor through a communication network from a server accessible on the Internet;

- 15 providing said server with a homepage with updated information from said microprocessor; and

changing said homepage which results in said server communicating said change to said microprocessor which in turn changes said status of said apparatus.

20

BRIEF DESCRIPTION OF THE DRAWINGS

To assist in understanding the invention reference is made to the following figures in which;

25

Figure 1 is a flow chart of the method of the present invention;

Figure 2 is a schematic diagram of a network employing the invention;

30

Figure 3 is a schematic diagram of the invention in conjunction with security arrangements;

Figure 4 is a schematic diagram showing the broad concept of the invention when used by utilities;

35

Figure 5 is a typical on-screen display that may be used by a home owner;

Figure 6 is a typical on-screen display in relation to an environment control
5 center; and

Figure 7 is a typical on-screen display in relation to a security control centre.

BEST MODES OF CARRYING OUT THE INVENTION

10

To further assist in understanding the invention reference is made to the following descriptions which should be read in conjunction with the accompanying drawings.

Intranet protocol

15

The invention relates to a method and an apparatus employing that method wherein a master webserver is connected to remote slave nodes using an appropriate protocol for control and automation over networks of different media including wire, radio, microwave and powerlines.

20

The arrangement that acts like a virtual Internet link (VIL) which therefore responds to requests from the server and remotes to replicate information as though the remote node is connected to the Internet. The virtual link can be used for remote information reading as well as home automation and security reflected in the master server. Remote nodes can act on the Internet
25 database information through a master/slave/exception protocol supporting automation, metering, security, electronic cash transfers and Internet URL (Universal Resource Location) requests.

30

In one embodiment of the invention a master/slave polling message establishes an event which is used to schedule any waiting exception message to be transmitted. The system features a master and slave architecture for initiating reception of secure Internet messages from any node. Each node may be polled systematically, by the server, which then
35 replicates the data between the related database record and the slave node. As a result of this arrangement the data transmission protocol establishes a virtual link to the Internet for remote metering, information, automation, security, control and electronic commerce in the home or

business. In addition the protocol allows messages to be forwarded to Internet service providers via the server to be able to surf the Internet via the eLink connection.

5 The invention allows, for example, the energy consumption from a mains electrical power supply to be measured at the remote node and a deduction of appropriate payments for subscribers according to authorised preprogrammed rates. A virtual Internet link allows for bi-directional secure electronic payments so that the attached smartcard and e-cash devices can
10 debit or credit approved payments. The automatic remote metering and control protocol is defined for communication between remote nodes and an on-line database web server (eg. Utility Gateway) which may communicate through data collection units supporting protocol conversion. A World Wide Web browser can monitor and control devices in homes and businesses
15 via the utility server and slave nodes using the virtual link enabled by this described method and protocol.

Combined Transfer Media Functionality

20 In a further embodiment of this invention there is proposed a method for operating a remote control and monitoring system that replicates data between a host computer located at a central server site and a set of automation nodes located at a remote site. The replicating protocol provides a virtual link between the said remote site to said central website, and
25 includes;

- means to monitor said data such as utility meter readings, security, finance and Internet requests; and
- means to link the data collected for subsequent access via the Internet

30 The system can communicate with a central server over existing wire and wireless communication systems, such as local telephone, cellular phone, radio, powerlines, landline, leased line, dial-up modem links and cable interfaces. The protocol may operate in a half-duplex mode over single transmission pair.
35

Local Electronic Billing and Payment

5 A further advantage of the system is that once information is known, the system may provide a gateway to advanced consumer services at the remote location including prepayment systems. For example the system could be used for an energy billing system for charging the energy usage of a metered device in accordance with a downloaded authorised rate schedule from a webserver. Each predefined rate schedule can define different times periods and amounts of payment deductions directly from an e-cash The
10 schedule of rates and periods form part of the VIL protocol which also supports the transmission of the metered utility consumption.

Back-Channel Web Browsing

15 A further advantage of the invention is that it can act as a service agent for fulfilling requests of a web browser client coupled to a local PC, Digital or Web TV set-top interface. This method of transmission of simplex Internet requests, mainly URL addresses is unique through exception messaging in combination with master/slave polling of automation and/or metering
20 information to the server. The one way simplex operation provides a back-channel capability for utility providers to deliver interactive services for their subscribers. Security, local government and on-line information providers are regarded as utilities in addition to the traditional providers of water, gas, electricity and telephone services. Under this scheme each home has a
25 equivalent IP address on the system and the remote node can send a request within the protocol.

With this back-channel capability URL's are sent from the home to broadcast Internet providers supporting web browsing from TV cable and satellite
30 downfeeds. A feature of the protocol is the reversal of the high integrity polled data which has low priority in response time combined with the low integrity Internet requests which gets the highest priority for speed of transmission. In this way the protocol can connect homes to the Internet through URL requests from set top boxes to their broadcast TV service
35 provider. The utility server can act as a half duplex server that is specifically designed to pass Internet requests to broadcast systems. With very little additional overhead to automated metering a utility provider can forward

subscriber Internet data requests to a broadcast service provider who can transmit Internet data to a browser running on a PC or TV with an Internet address.

5 Internet Control

The invention also provides a method of controlling devices attached to remote nodes provided through the Internet by the virtual linking of data records in the master web server. Under this arrangement each remote
10 node has a virtual Internet address which is replicated from the server database. The web server can have the capability to be changed by authorised users through the Internet using a range of available commercial technologies. The database fields in the records (including security and air-conditioning controls) are dynamically linked to the remote nodes
15 (automation interface node) by the VIL Protocol using a master/slave polling method with error checking to ensure integrity. This enables residents and other subscribers to turn on a range of connected devices in the home or work premises using the Internet.

20 Replication through sub-networks

Data concentrators may be of a type that use the same communication protocols as the remote nodes. This provides a means to route messages to a destination node through a second network and still maintain the virtual
25 link between the server and the remote node. Data Concentrators are routers used to speed up communications in systems with many slaves. Each Data Concentrator replicates communication to a group of slaves through one communication port and acts as a large slave through the second port. The software then replicates the second port as if it were a
30 large slave with increased speed.

The Data Concentrator or Replicator can act as a Protocol Converter and communicate with the server using a higher speed communication channel using a variety of protocols yet maintaining the overall virtual Internet Link
35 protocol between master server and slave node. The Data Concentrators can communicate with the slave devices using dial-up telephone, leased line, microwave, radio or satellite interfaces. Additional wide area or local area

network interfaces can be used. A store and forward feature allows any Data Concentrator to relay a message to another when direct re-transmission is not possible. The data concentrator can be used to pass on or relay the message in both directions.

5

Exception Messaging

In another embodiment the present invention provides for a method to support exception message transmission from the slave node when a request is initiated. When such a request is detected the slave unit initiates a transmission to the Master unit and transfers that data. Timing is used to avoid potential collisions using the slave address to do this. Before any unit transmits it must first detect if any other unit is transmitting. This is achieved by detecting the break in the polled transmission and if another exception transmission is detected it delays until the end of the next polled transmission before it tries again. When multiple slaves require transmission at the same time an avalanche effect can result causing erratic system operation and sometime system failure. To cope with this a fall back process is used so that if after all possible attempts send the message caused by the exceptions have failed, each slave stops trying to transmit and waits until polled by the master.

10

15

20

25

The present invention thus relates to a method for a virtual link, hereinafter referred to as eLink interconnecting online database records to automation apparatus using a different type of message protocol with embedded URL's referenced to international standard addresses for home and business devices. The new protocol allows for utility load shedding over the Internet where the utilities may include water, gas, electricity, telecommunications, security and the Internet.

30

35

In a preferred embodiment there is provided a method for a virtual link interconnecting online database records to automation apparatus using a different type of message protocol with embedded URL's referenced to international standard database addresses for home and business devices. eLink protocol allows for utility load shedding over the Internet. Utilities include water, gas, electricity, telecommunications, security and Internet. eLink establishes a virtual link to the Internet for metering, information, automation, security, control and electronic commerce in the home or business. In addition Internet request messages can be forwarded to Internet service

providers via eLink. eLink collects data from the special purpose eHub automation interface in the home. This is based on embedded internet protocols IP associated with each microprocessor automation interface (eHub).

5 At the other end, eLink is able to connect with a secure Web Server database. The database uses IP extended addressing to map each device in the home into internet address space and is used to collect utility data from remote meters, as well as hold the status of each device for remote access over the internet.

10 Each home owner is represented by encrypted records in the data base, and access to relevant fields is available to each participating utility. This is illustrated in Figure 1 where the desired home appliances or utilities are mirrored on an external server. eLink provides each home owner with access to their specific meter reading data that has been collected in the data base. eLink can also provide each utility with access to
15 its specific data in the data base. eLink thus provides the basis for both home owners and utilities to share and monitor utility resource usage.

Home owners can also perform other home based transactions and access the Internet using eLink. Transactions may be initiated from the home or any other location
20 with an Internet connection. In particular, the home owner can initiate requests for data to be sent via cable or satellite to the TV in the home. This allows for datacasting and multicasting requests to be serviced over the utility infrastructure.

It may be noted that in the home, eHub works with all a range of home management and remote devices including C-Bus, X10, CE-Bus, I-wire and other protocols which
25 may be multiplexed through eHome wiring network in the home. eLink assists utilities to develop systems for automatic meter reading and load shedding leading using the internet. This leads to prompt payment or prepayment systems based on ecommerce from the webserver databases.

30 eLink is a virtual link replicating online database records to the eHub automation interface in the home. eLink is used for remote information reading as well as home automation and security replicated in the webserver. The media independent eLink network connection with the home, exchanges URL information supporting
35 automation, metering, security, ecommerce transfers and Internet backchannel requests.

eLink is designed to work with a range of home management systems and devices.

eLink will support with industry standards such as CEBus and Universal Plug and Play through cross matching standard addresses into the eLink URL message structure.

- The automatic remote metering and control protocol provides communication
- 5 between the eHub and an online database web server (eg. Utility Gateway). This enables the home owner to monitor and control devices in home via a web browser either in the home or remotely through the Internet, examples of this shown in Figure 5 where a home owner may access any one of a number of control panels such as appliance, security, environment or utilities. Once a particular panel is chosen, such as
- 10 the environment in Figure 6 and security in Figure 7 the home owner can change control different systems. Thus, the home owner can turn the air conditioner on, and next time that the server updates the eHub the actual command is executed in the home.
- 15 In the future this allows each home to have a equivalent IP address without a PC in the home as it resides on the Utility Gateway server. The remote eHub node can send a request within the protocol. With this backchannel capability, URL's can be sent from the home to broadcast Internet providers supporting web browsing from TV via cable and satellite broadcast services. This feature can connect
- 20 homes to the Internet through URL requests from eHome's to their broadcast TV service provider. The utility server can act as a half duplex server that is specifically designed to pass Internet requests to these broadcast providers. By using very little additional overhead to automated metering, a utility provider can forward subscriber Internet data requests to a broadcast service provider who can
- 25 transmit Internet data to a browser running on a PC or TV with an Internet address.

- Remote control is provided through the Internet by the linking of data records in the gateway Web Server. Under this arrangement each remote node has a virtual Internet address which is replicated from the server database. The home record in the
- 30 server has the capability to be changed by authorised users though the Internet using eCommerce security methods (eg name & password or digital signature). The database fields in the records (including security and air-conditioning controls) are dynamically linked to the automation interface to enable residents and valid subscribers to turn on a range of connected devices in the home using the Internet.
- 35

The eHub control panel, designed for the home, will provide a convergent point of access to phone, water, gas, electricity, Internet and security services.

The eHome system may handle totalising counts from electricity, water and gas meters with pulsed or digital outputs including protection against tampering with the inputs. Interface to existing home automation systems is achieved through digital I/O and serial ports which allow for optional connection to a PC including providing a shared modem facility in the home.

The master/slave polling message establishes an event which is used to schedule any waiting exception message to be transmitted after a programmable time delay.

The eLink system features a master and slave architecture for initiating reception of secure Internet requests messages from any node. Each node may be polled systematically, on a virtually continuous or periodic basis, by the server, which then replicates the data between the related database record and the addressed slave node. As a result of this arrangement the data transmission protocol establishes a virtual link to the Internet for remote metering, information, automation, security, control and electronic commerce in the home or business. In addition the protocol allows messages to be forwarded to Internet service providers via the server to be able to surf the internet via the eLink connection.

The energy consumption measured at the remote node may deduct e-cash payments for subscribers according to authorised pre-programmed rates. The virtual Internet link allows for bi-directional secure electronic payments so that the attached smartcard and e-cash devices can remove debit or provide credit approved payments. The automatic remote metering and control protocol is defined for communication between remote nodes (eg. eHub) and an online database web server (eg. Utility Gateway) which communicate through data collection units supporting protocol conversion. A World Wide Web browser can monitor and control devices in homes and businesses via the utility server and slave nodes using the virtual link enabled by the this defined described method and protocol.

A Utility Gateway Server, includes a computer which is connected to the Internet and the remote nodes through a data concentrator multiplexer unit for generation of commands and the receipt of data over communication lines. The commands generated by the server contain an address portion and a command message portion.

There is an eHub automation interface node located at each customer residence. Each automation interface node is capable of selectively communicating with a plurality of utility meters and attached devices, for selectively driving a plurality of devices at a

customer residence, for monitoring the status of a plurality of external contacts, and for selectively providing a plurality of alarms and messages to the customer. Each node includes a receiver for receiving commands from the server over a plurality of communication lines as well as a transmitter for transmitting return messages to the server over the same communication line. In order to increase the through-put capability, the protocol allows priority to requests for Internet addresses over commands for meter reading and security transfers.

The present invention thus provides a remote automatic meter reading, control and security system as a background activity. It may further provide an automatic utility payment system, with encrypted security, for payment of the measured reading of a consumed commodity using a range of electronic commerce methods accepted by the consumer and the utility. Yet further it may provide a remote automatic meter reading, control and customer alert system incorporating controls for improving the energy management of utility services by customer usage and exception reporting, as well as assuring that loads which have been authorised to be turned off by the system will once again be turned on.

Still further still the invention may provide a master/slave command and message interlaced with customer event requests whereby the data throughput for Internet requests is enhanced. Yet further still the present invention may provide a meter reading, control and security system incorporating polled message formats in order to provide high integrity of customer billing information, security system operation and electronic funds transfer to the server database.

eLink is a unique IP based protocol for home automation using powerlines, telephone wire and radiowireless media. Under this scheme each home has an IP address on a server database with utility fields (including security and air-conditioning controls) dynamically linked to the home embedded controller (eHub automation interface node) using a master/slave polling with Internet IP embedded protocol. IP addresses can be sent from the home for supporting Internet web browsing.

This eLink protocol would run on a range of hardware including the eHub in the home where it can connect to lighting, environment and entertainment networks. e-cash controls can be transferred in both directions and the protocol is suitable for industrial telemetry applications.

The Home Management System includes utility billing and control via the Internet.

Each home has a equivalent TCP/IP address like a street address and crossed referenced to the telephone number. The protocol includes security and authorised access to standards accepted for electronic commerce. The eLink protocol is an efficient communications scheme to provide a virtual link to connect a record in the server database to a number of services in the home.

Embedded controller technology in the automation interface provides an in-home local-area network (LAN) that can control home appliances and services that implement multiple protocols in addition to the virtual link to the Utility gateway server.

Each household can use a set-top box or PC as a terminal for interfacing the automation interface with major home appliances and consumers. eLink allows telemetry to function over radio, powerlines landline, leased line, dial-up modem links and cable interfaces such as RS232, RS422, RS485. Via external converters it is also possible to link units via fibre optic.

eLink can be used for SCADA (Supervisory control and data acquisition) systems where SCADA refers to the combination of the fields of telemetry and data acquisition encompassing the collection of the information, transferring it back to a central site, carrying out any necessary analysis and control and then displaying this data on a number of operator screens.

The server as master makes regular, repeated requests for data to each slave (eHub) in sequence, writing the data to each unit and reading that unit's data back in response. This is a half duplex protocol where the slave only responds to a request from the master. Each slave unit has a unique address or identification number based on IP sub-addressees to allow this to function correctly. If the slave does not respond within a defined time, the master will retry again (up to a configurable number of retries) and then carries on polling the other units in the system. It is possible to retry that unit again on several more re-transmissions before marking it as failed link after which the master will only poll it once each poll period to enable a restored link to be detected.

To overcome some of the following disadvantages in polled systems eLink can use sub-master networks so that there are several small, fast messages which can be received by the server master in between polled messages.

- Normally the interrupt type requests from a slave requesting urgent action cannot be handled within master/slave protocols.
- Systems which are lightly loaded with minimum data changes from a slave are quite inefficient and unnecessarily slow

eLink supports Report By Exception as the slave station monitors its own inputs for a request for Internet data. When such a request is detected the slave unit initiates a transmission to the Master unit and transfers that data. Timing is used to avoid potential collisions using the slave IP sub address to do this. Before any unit transmits it must first detect if any other unit is transmitting. This can be done by detecting the break in the polled transmission and another exception transmission is detected transmission a delay is required until the end of the next polled transmission before it tries again. When multiple slaves require transmission at the same time an avalanche effect can result causing erratic system operation and sometime system failure. To cope with this a fall back process is used so that if after all possible attempts send the message caused by the exceptions have failed, each slave stops trying to transmit and waits until polled by the master.

The advantages of this are:

- It reduces the unnecessary transfer of data at any particular time as in polled systems.
- URL requests are detected quickly.

Internet addresses are assigned to slave nodes on the Internet server which is the master for the network. Each host gateway server must have its own Internet address and support sub-addresses for each slave node. A database is normally used for Address Resolution and storage of information exchanged with each slave. It should also translate Internet addresses to Ethernet addresses when needed with LANS and WANS.

eLink protocol runs over a variety of network media: IEEE 802.3 (ethernet) and 802.5 (token ring) LAN's, X.25 lines, satellite links, and serial lines. There are standard encapsulations for eLink packets defined for many of these networks. Serial Line eLink, is used for master/slave serial connections using wire and wireless media.

eLink defines a sequence of characters that frame data packets on a serial line. It provides addressing, packet type identification, error detection/correction and compression mechanisms.

eLink is used for automation applications. It supports URL requests to connect homes to the Internet through a secure webserver. The utility server can act as a half duplex server that is specifically designed to pass Internet requests to broadcast systems. With very little additional overhead an utility server can

forward customer data requests to a broadcast service provider who can transmit Internet data to a browser running on a PC or TV with an Internet address.

eLink Wire Cable

- 5 Peripheral monitoring devices such as movement detectors have traditionally been connected to a host by means of four core cable. The advent of low cost cameras and the image handling capability of eHome means that video surveillance will increasingly be used. eLink uses eight core Category 5 cable via RJ45 plugs and sockets to
10 connect peripheral devices to eHub remote nodes.

To allow manufacturers of peripheral devices to ensure their products are compatible with eHome and directly connectable to eHub nodes the following wiring printout is defined using any colours in the designated order by the following table:

15

Wire colour	Function	Cat5 pin
White/green	Video / AC	1
Green	Video /AC	2
White/orange	+ 12V	3
Blue	+ 5V	4
White/blue	eLink	5
Orange	Ground	6
White/brown	Signal / eLink Back Channel	7
Brown	Tamper / eLink Back Channel	8

Thus, the present invention also provides a master wiring key configuration for multiple use of Category cable as defined by the eLink wire printout definition which is combined with unique numbers for each device on pin 3.

20

Embedded URL Address

- eLink uses an embedded IP protocol with 128-bit addressing, allowing for an expanded addressing scheme involving sub-addressing. eLink uses the 128-bit
25 address as follows:

No of bytes Description

- | | | |
|---|-------|-------------------------------------------------------------------------------------------------------------|
| | 0-3 | Standard IP Address |
| | 4-7 | Customer ID, 10-digit phone number in binary, for example |
| 5 | 8-11 | Bit – cross-referenced to tables for Contact ID, CEBus Number, X10 Address, Status, enabling and command |
| | 12-15 | Operator – set as a value, giving and on/off status and values eg temperature readings, and meter readings. |

10 The 128-bit address structure of eHome comprises a main address and three sub-addresses. Each address has specific significance to a Web browser:

A virtual link is created from the database to the device. eLink devices could be any or all of the following:

- | | |
|----|----------------------------------------------------------------------|
| | • Security Camera |
| 15 | • Air conditioner, heating unit, lights, and other connected devices |
| | • Utility Meters for Electricity, Gas, Water and Recycled Water |
| | • Energy Management Control |

20 The database itself is stored on a secure web server, and accessed through a website. The application (1) running continuously scans the database, checking for any updates, modifications, new or deleted entries, etc.

25 When a client wished to access their home though the website, a message (2) is sent from the application to the modem connected to the web server. The message can be in the form of:

- | | |
|----|--------------------------------------------------------------------|
| | • A Secure eLink Message via E-mail |
| | • A Dial-up Connection via modem using TCP/IP |
| | • Direct Internet Connection using TCP/IP (ie. not through E-mail) |
| 30 | • Or Another Form such as radio and powerlines |

Each house that has eHome installed uses a modem, which is connected through the Security System. The message is received by this modem, which sends it over the CEBus, or other transmission media to devices connected to the eHub.

35 If eHub is also connected to a computer, this receives the message and initiates corresponding actions to devices in the home. The message contains information to perform functions or gather information for these devices in the home. These include:

- Security Camera Pictures

- Turning on/off devices
- Reading Utility Meters
- Energy Control reading and change of mode setting

5 **Internet protocol V6**

The present invention is particularly useful when the new Internet Protocol, Version 6 (IPv6) will become the standard. IPv6 is designed to be a simple, forward-compatible upgrade to the existing version of IP. This upgrade is
10 also intended to resolve all of the weaknesses that IPv4 is currently manifesting, including the shortage of available IP addresses, the inability to accommodate time-sensitive traffic, and its lack of network layer security.

The next generation of IP, commonly known as IPng but more correctly identified as
15 IPv6, offers a vastly expanded addressing scheme to support the continued expansion of the Internet, and an improved ability to aggregate routes on a large scale.

IPv6 also supports numerous other features, such as real-time audio or video transmissions, host mobility, end-to-end security through network layer encryption and authentication, as well as auto-configuration and auto-reconfiguration. It is expected that
20 these services will provide ample incentive for migration as soon as IPv6-capable products become available. Many of these features still require additional standardization. Therefore, it would be premature to expound upon them at any great length.

25 The one aspect of IPv6 that can, and should, be expounded upon is its addressing. IPv4's 32-bit address length gave the protocol a theoretical capability to address 2^{32} power, or about 4 billion devices. Inefficient subnet masking techniques, among other wasteful practices, has squandered this resource.

IPv6 uses a 128-bit address and is theoretically capable of 2^{128} power times
30 the size of the IPv4 address space. This equals 340,282,366,920,938,463,463,374,607,431,768,211,456 mathematically possible addresses. Only about 15 percent of this potential address space is currently allocated. The remainder is reserved for future use and includes the capacity for eLink messages by direct IP mapping of devices in the home.

CLAIMS

1. A system for the remote control and monitoring of at least one electrical apparatus, said system including;
a first and second control means in communication with each other, said first
5 control means also in communication with said apparatus;
said first control means adapted to receive information as to the status of said apparatus and transmit it to the second control means;
said second control means including a dynamic memory storing said status of said apparatus, a display means for displaying said status, and a control
10 means adapted to receive instructions from a user to set the status of the apparatus;
wherein when the user operates said apparatus by acting on said control means changing its status to a different state the second control means communicates that change to the first control means which accordingly
15 activates said apparatus; and
wherein if the state of the apparatus is changed, the first control means then communicates the new state to the second control means, altering the stored and displayed status.
2. A system for the remote control and monitoring of at least one
20 apparatus, said system including;
a first control means adapted to communicate with said apparatus;
a second control means adapted to communicate with said first control means;
said first control means further adapted to communicate with said second
control means;
25 said second control means including a memory storing information about the status of said apparatus and including an input means enabling said status to be altered;
wherein when said status has been altered the second control means communicates said new status to said first control means which subsequently
30 checks the status of said apparatus and alters it if necessary to be the same as the new communicated status and wherein when the status of said

apparatus has been altered the new status is communicated to the first control means and to the second control means, said second control means altering the memory to reflect the status of the apparatus;

said input means comprising a web-addressable link whereby a user can access said memory via the internet.

3. A system for the remote access of at least one utility meter said system including;

a first control means adapted to communicate with said meter;

a second control means adapted to communicate with said first control means;

said first control means further adapted to communicate with said second control means;

said second control means including a memory storing information about the status of said meter wherein said status is updated by the first control means communicating said new status to said second control means status and

wherein when the status of the meter has been altered the new status is communicated to the first control means and to the second control means, said second control means altering the memory to reflect the status of the meter; said system further including an input means comprising a web-addressable link whereby a user can access said memory via the Internet.

4. A system as in any one of Claims 1 to 3 wherein said information is security protected from access by unauthorised persons.

5. A system as in Claim 3 wherein said meter information is further accessible by the appropriate utility authority through said second control means.

6. A system as in Claim 5 wherein said utility authority can control said utility meter.

7. A system as in any one of the above Claims wherein said second control means communicates to said first control means via the Internet.

8. A system as in any one of Claim 1 to 3 wherein said second control means communicates with said first control means via an electrical power distribution means.
9. A system as in any one of the above Claims wherein said second
5 control means receives regular status updates from said first control means.
10. A system as in Claim 6 wherein said updates occur at regular pre-determined temporal intervals.
11. A system as in Claim 6 wherein said updates occur continuously.
12. A system as in any one of the above Claims wherein said status
10 includes information such as control information, management information and service information of said apparatus.
13. A system as in any one of Claims 1-3 wherein said first control means is a microprocessor.
14. A system as in any one of the above Claims wherein said second
15 control means is a computer server.
15. A system as in Claim 14 wherein said information is a home page on said server.
16. A management apparatus for electrical apparatus including;
a control means on said apparatus;
20 a sensor on said apparatus communicating information about said apparatus to a microprocessor;
said microprocessor adapted to communicate with a server, said server accessible through the Internet and having a homepage which reflects the status of said apparatus wherein when the status of the apparatus changes,
25 the homepage is changed to reflect the new status and when the homepage is changed the apparatus is controlled and changed to reflect the new status.

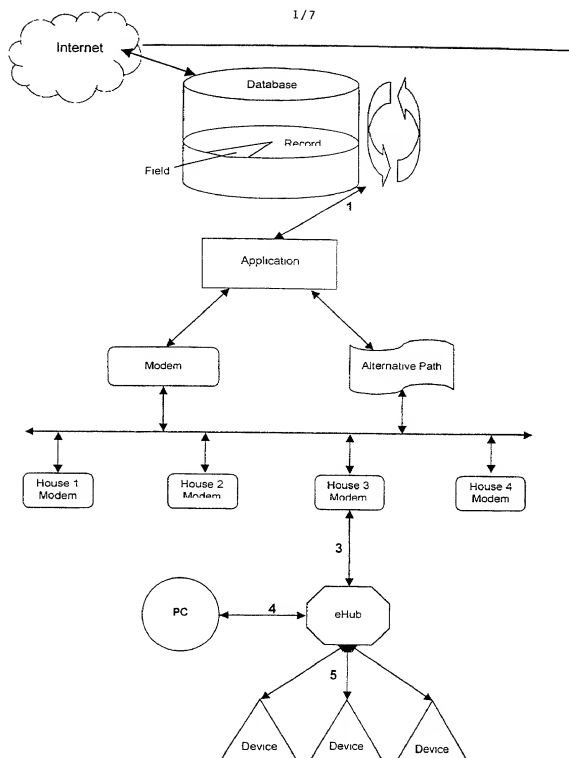


Fig 1

eHome Network Remote Control

2/7

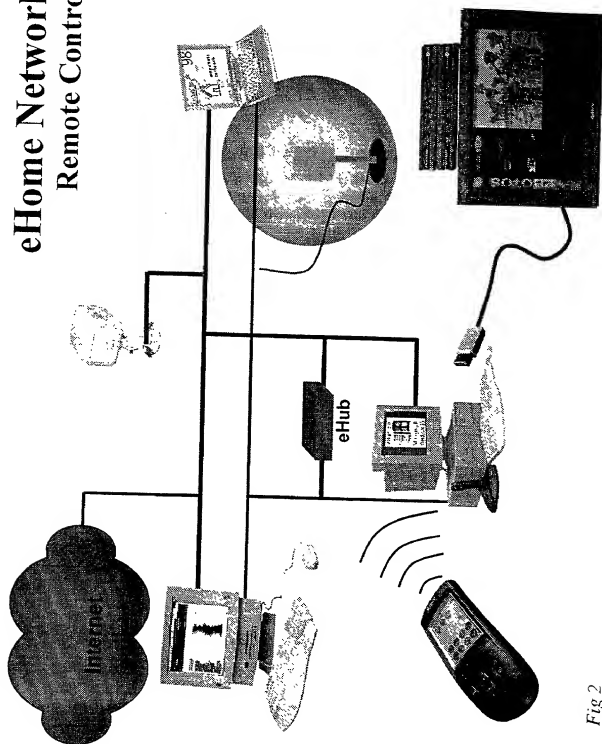


Fig 2

Security and the Internet

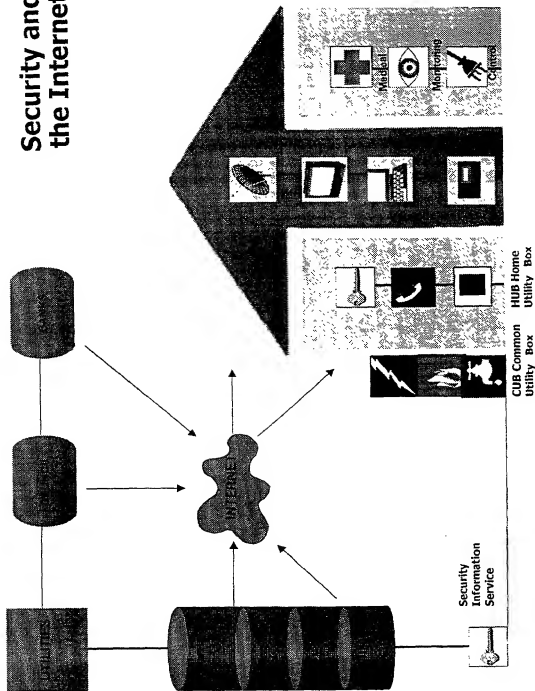


Fig 3

Secure Online Server

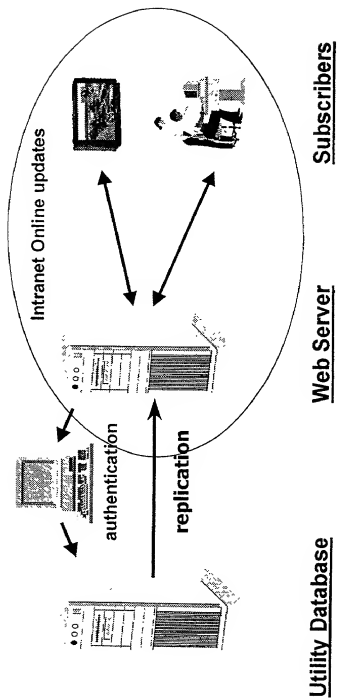


Fig 4

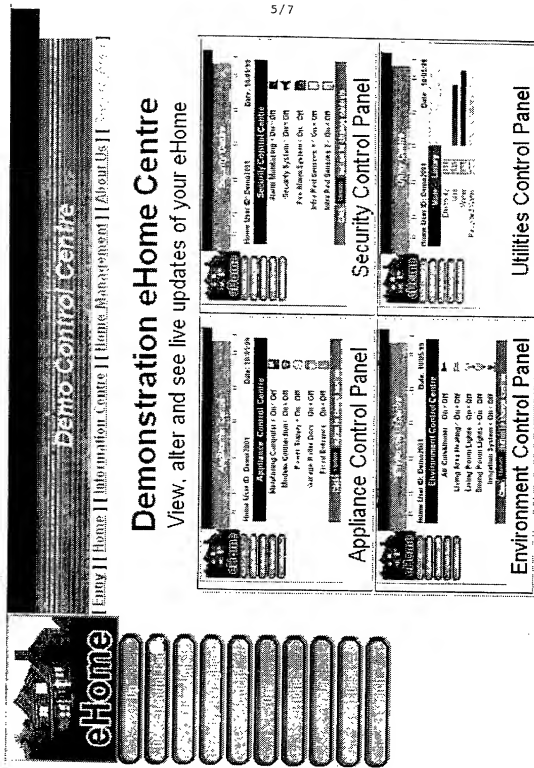


Fig 5

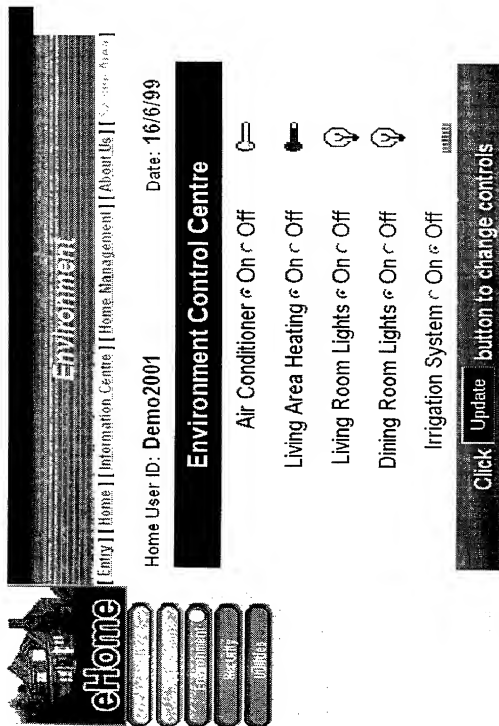


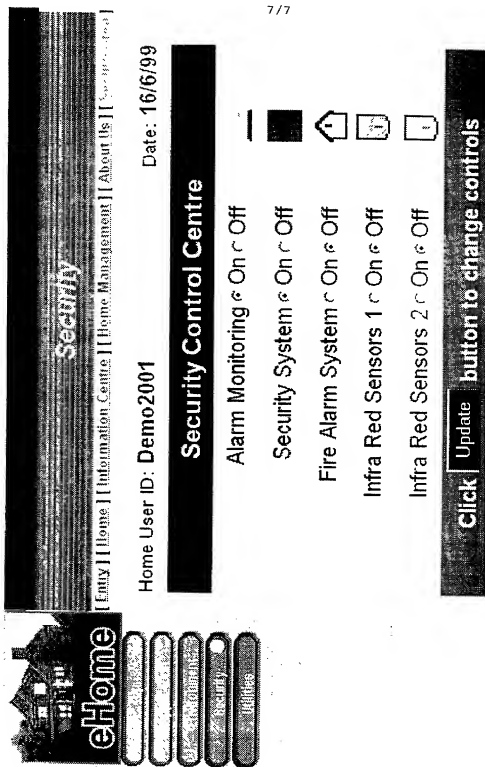
Fig 6

000001 00000000

WO 00/04427

09/6/3885

PCT/AU99/00576



7/7

Fig 7

Docket No.
1849-C

Declaration and Power of Attorney For Patent Application

English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

INTERNET UTILITY INTERCONNECT METHOD AND MEANS

the specification of which

(check one)

☐ is attached hereto.

☒ was filed on 16 July 1999 as United States Application No. or PCT International Application Number PCT/AU99/00576

and was amended on 24 March 2000 and by way of preliminary amendment to the U.S. application (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)		Priority	Not Claimed
PP4710	Australia	16 July 1998	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	<input type="checkbox"/>

I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional application(s) listed below:

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

I hereby claim the benefit under 35 U. S. C. Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. Section 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, C. F. R., Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

PCT/AU99/00576

16 July 1999

Pending

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

Joseph A. Sebolt, Reg. No. 35,352

Frederick H. Zollinger III, Reg. No. 39,438

Daniel J. Long, Reg. No. 29,404

Send Correspondence to: Joseph A. Sebolt
SAND & SEBOLT
4801 Dressler Road, NW
Canton, Ohio 44718

Direct Telephone Calls to: *(name and telephone number)*
Joseph A. Sebolt (330) 492-1925

Full name of sole or first inventor
NGO, Get Sen

Sole or first inventor's signature 

12 May 2000

State

Residence
9-3 Orange Lane, Norwood, South Australia 5067, Australia

AUX

Citizenship
Australian

Post Office Address
9-3 Orange Lane, Norwood, South Australia 5067, Australia

Full name of second inventor, if any
PARSONS, Ewan

Second inventor's signature 

12 May 2000

State

Residence
239 Magill Road, Stepney, South Australia 5067, Australia

AUX

Citizenship
Australian

Post Office Address
239 Magill Road, Stepney, South Australia 5067, Australia